

## SCIENCE

Academic content standards and resources are available at:

<http://www.doe.in.gov/standards>

Teacher requirements for this subject area are available at:

<http://doe.in.gov/dps/licensing/assignmentcode>

### Introduction

Indiana's Academic Standards for Science, adopted in 2000 by the State Board of Education, are based on the *Benchmarks for Science Literacy*, from the American Association for the Advancement of Science's Project 2061. They are presented by grade level from kindergarten through Grade 8 and by individual course for high school. Through Grade 8 the Standards are organized as six content strands: (1) The Nature and Science of Technology; (2) Scientific Thinking; (3) The Physical Setting; (4) The Living Environment; (5) The Mathematical World; (6) Common Themes. High school courses each have two standards: (1) Principles of each subject area and (2) Historical Perspectives.

Rules of the State Board of Education for each diploma are as follows:

General	Core 40	Academic Honors	Technical Honors
Four credits from more than one of the three major categories in Life Science, Physical Science, and Earth and Space Science.	Six credits in science: two credits in Biology I, two credits in Chemistry I, Physics I, or Integrated Chemistry-Physics, and two additional credits in Chemistry, Physics, Earth and Space Science, Advanced Biology, Advanced Chemistry, Advanced Physics, or Advanced Environmental Science.	The same course requirements as the Core 40 diploma, but students must earn a grade of "C" in order for a course to count towards this diploma. In addition, students must have a grade point average of "B" or above.	The same course requirements as the Core 40 diploma, but students must earn a grade of "C" in order for a course to count towards this diploma. In addition, students must have a grade point average of "B" or above.

### ADVANCED LIFE SCIENCE, ANIMALS (L)

(ALS ANML)

5070

CIP Code: 26.0701

*Advanced Life Science, Animals*, is a standards-based, interdisciplinary science course that integrates biology, chemistry, and microbiology in an agricultural context. Students enrolled in this course formulate, design, and carry out animal-based laboratory and field investigations as an essential course component. Students investigate key concepts that enable them to understand animal growth, development and physiology as it pertains to agricultural science. This course stresses the unifying themes of both biology and chemistry as students work with

concepts associated with animal taxonomy, life at the cellular level, organ systems, genetics, evolution, ecology, and historical and current issues in animal agriculture. Students completing this course will be able to apply the principles of scientific inquiry to solve problems related to biology and chemistry in highly advanced agricultural applications of animal development.

- ☐ Suggested Grade Levels: 11-12
- ☐ Highly Recommended Prerequisite: Biology and Chemistry due to course content standards
- ☐ A two semester course, one credit per semester
- ☐ Counts as a Life Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas or as an Elective or Directed Elective for any diploma
- ☐ A Career Academic Sequence, Career-Technical program, or Flex Credit course
- ☐ Additional academic content standards: <http://www.indianaaged.org/AgEdStandards.htm>
- ☐ State Additional Pupil Count (APC) vocational funding available if taught by appropriate Licensed Teacher [http://doe.state.in.us/octe/docs/cip\\_0809crosswalk.pdf](http://doe.state.in.us/octe/docs/cip_0809crosswalk.pdf)

### **ADVANCED LIFE SCIENCE, FOODS (L)**

(ALS FOODS)

5072

CIP Code: 01.1001

*Advanced Life Science, Foods*, is a standards-based, interdisciplinary science course that integrates biology, chemistry, and microbiology in an agricultural context. Students enrolled in this course formulate, design, and carry out food based laboratory and field investigations as an essential course component. Students understand how biology, chemistry, and physics principles apply to the composition of foods, food nutrition and development, food processing, and storage. Students completing this course will be able to apply the principles of scientific inquiry to solve problems related to biology, physics and chemistry the context of highly advanced agricultural applications of food.

- ☐ Highly Recommended Prerequisite: Biology and Chemistry due to course content standards
- ☐ A two semester course, one credit per semester
- ☐ Counts as a Life Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ Counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence, Career-Technical program, or Flex Credit course
- ☐ Additional academic content standards: <http://www.indianaaged.org/AgEdStandards.htm>
- ☐ State Additional Pupil Count (APC) vocational funding available if taught by appropriate Licensed Teacher [http://doe.state.in.us/octe/docs/cip\\_0809crosswalk.pdf](http://doe.state.in.us/octe/docs/cip_0809crosswalk.pdf)

### **ADVANCED LIFE SCIENCE, PLANTS AND SOILS (L)**

(ALS PLT/SL)

5074

CIP Code: 26.0301

*Advanced Life Science, Plant and Soil*, is a standards-based, interdisciplinary science course that integrates the study of advanced biology, chemistry, and earth science in an agricultural context. Students enrolled in this course formulate, design, and implement agriculturally-based laboratory and field investigations as an essential course component. These extended

laboratory and literature investigations focus on the chemical reactions of matter in living and nonliving materials while stressing the unifying themes of chemistry and the development of physical and mathematical models of matter and its interactions. Using the principles of scientific inquiry, students examine the internal structures, functions, genetics and processes of living plant organisms and their interaction with the environmental. Students completing this course will be able to apply the principles of scientific inquiry to solve problems related to both biology and chemistry in the context of highly advanced agricultural applications of plants and soils.

- ☐ Highly Recommended Prerequisite: Biology and Chemistry due to course content standards
- ☐ A two semester course, one credit per semester
- ☐ Counts as a Life Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ Counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence, Career-Technical program, or Flex Credit course
- ☐ Additional academic content standards: <http://www.indianaaged.org/AgEdStandards.htm>
- ☐ State Additional Pupil Count (APC) vocational funding available if taught by appropriate Licensed Teacher [http://doe.state.in.us/octe/docs/cip\\_0809crosswalk.pdf](http://doe.state.in.us/octe/docs/cip_0809crosswalk.pdf)

### **ADVANCED SCIENCE, COLLEGE CREDIT (L)**

**3090** (ADV SCI CC)

*Advanced Science, College Credit* is a title that covers (1) any science course offered for credit by an accredited postsecondary institution through an adjunct agreement with a secondary school, or (2) any other postsecondary science course offered for dual credit under the provisions of 511 IAC 6-10.

- ☐ Recommended Grade Level: 11-12
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

### **ADVANCED SCIENCE, SPECIAL TOPICS (L)**

**3092** (ADV SCI ST)

*Advanced Science, Special Topics* is any science course which is grounded in extended laboratory, field, and literature investigations into one or more specialized science disciplines, such as anatomy/physiology, astronomy, biochemistry, botany, ecology, electromagnetism, genetics, geology, nuclear physics, organic chemistry, etc. Students enrolled in this course engage in an in-depth study of the application of science concepts, principles, and unifying themes that are unique to that particular science discipline and that address specific technological, environmental or health-related issues. Under the direction of a science advisor, students enrolled in this course will complete an end-of-course project and presentation, such as a scientific research paper or science fair project, integrating knowledge, skills, and concepts from the student's course of study. Individual projects are preferred, but group projects may be appropriate if each student in the group has specific and unique responsibilities.

- ☐ Recommended Grade Level: 11-12
- ☐ Credits: A two credit course

- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

## **ANATOMY & PHYSIOLOGY**

5276

(A & P)

CIP Code: 26.0403

*Anatomy & Physiology* is a course in which students investigate concepts related to the Health Sciences. Through instruction, including laboratory activities, students apply concepts associated with Human Anatomy & Physiology. Studies include the process of homeostasis and the essentials of human function at the level of genes, cells, tissues, and organ systems. Students will understand the structure, organization, and function of the various components of the healthy human body in order to apply this knowledge in all health-related fields.

Students enrolled in this course should have a basic understanding of the Principles of Biology including:

- ☐ Molecules and Cells
- ☐ Developmental and Organismal Biology
- ☐ Genetics

Students should also know the principles of atomic structure, bonding, molecules, and structural formulas, types of chemical reactions, principles of acids and bases, and molarity.

The course should include ample laboratory experiences that illustrate the application of the standards to the appropriate cells, tissues, organs, and organ systems. Dissection is both appropriate and necessary. Students should be able to use basic laboratory equipment such as microscopes, balances, and pipettes.

- ☐ Recommended Grade Level: 11-12
- ☐ Required Prerequisite: First-Year course of same discipline (Biology)
- ☐ Recommended Prerequisite: Chemistry, Introduction to Health Care Systems
- ☐ Credits: A two-semester course, one credit per semester
- ☐ Counts as a Life Science Course for the General, Core 40, Core 40 with Academic Honors, and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence, Career-Technical program, or Flex Credit course
- ☐ Academic content standards:  
[http://www.doe.in.gov/octe/health/hce/anatomy\\_physiology.pdf](http://www.doe.in.gov/octe/health/hce/anatomy_physiology.pdf)
- ☐ Curriculum Framework: [http://www.doe.in.gov/octe/health/hce/anatomy\\_physiology.pdf](http://www.doe.in.gov/octe/health/hce/anatomy_physiology.pdf)
- ☐ State Additional Pupil Count (APC) vocational funding available if taught by CTE licensed Health Sciences teacher

## **BIOLOGY I (L)**

(BIO I)

3024

*Biology I* is a course based on laboratory investigations that include a study of the structures and functions of living organisms and their interactions with the environment. At a minimum, students enrolled in Biology I explore the structure and function of cells, cellular processes, and the interdependencies of organisms within populations, communities, ecosystems, and the biosphere. Students work with concepts, principles, and theories of the living environment. In

addition, students enrolled in this course are expected to: (1) gain an understanding of the history and development of biological knowledge, (2) explore the uses of biology in various careers, and (3) investigate biological questions and problems related to personal needs and societal issues.

- ☐ Recommended Grade Level: 10
- ☐ Credits: A two credit course
- ☐ Fulfills the Biology requirement for the General (Class of 2010 and subsequent classes), Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

## **BIOLOGY II (L)**

(BIO II)

3026

*Biology II* is an advanced laboratory, field, and literature investigations-based course. Students enrolled in Biology II examine in greater depth the structures, functions, and processes of living organisms. Students also analyze and describe the relationship of Earth's living organisms to each other and to the environment in which they live. In this course, students refine their scientific inquiry skills as they collaboratively and independently apply their knowledge of the unifying themes of biology to biological questions and problems related to personal and community issues in the life sciences.

- ☐ Recommended Grade Level: 10
- ☐ Recommended Prerequisite: Biology I
- ☐ Credits: A two credit course
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

## **BIOLOGY, ADVANCED PLACEMENT (L)**

(BIO AP)

3020

*Biology, Advanced Placement* is a course based on the content established by the College Board. Topics include: (1) molecules and cells: chemistry of life, cells, cellular energetics; (2) heredity and evolution: heredity, molecular genetics, evolutionary biology; and (3) organisms and populations: diversity of organisms, structure and function of plants and animals, ecology. The major themes of the course include: science as a process, evolution, energy transfer, continuity and change, relationship of structure to function, regulation, interdependence in nature and science, technology, and society. A comprehensive description of this course can be found on the College Board AP Central Course Description web page at:

<http://apcentral.collegeboard.com/apc/public/courses/descriptions/index.html>

- ☐ Recommended Grade Level: 11-12
- ☐ Recommended Prerequisite: Biology I and Chemistry I
- ☐ Credits: A two credit course
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

## **BIOLOGY HIGHER LEVEL, INTERNATIONAL BACCALAUREATE**

3032

(BIO H IB)

*Biology Higher Level, International Baccalaureate* focuses on six core topics: cells, the chemistry of life, genetics, ecology, evolution, and human health and physiology. Students must complete additional study in eight topics: nucleic acids and proteins, cell respiration and photosynthesis, human reproduction, defense against infectious disease, nerves, muscles and movement, excretion, and plant science. Optional course topics for students include diet and human nutrition, physiology of exercise, neurobiology and behavior, applied plant and animal science, and ecology and conservation.

- ☐ Recommended Grade Level: Grades 11 and 12
- ☐ Credits: 4 semester course, 1 credit per semester
- ☐ Fulfills the Biology I requirement for the General, Core 40, Core 40 with Academic Honors, Core 40 with Technical Honors and International Baccalaureate diplomas or counts as an Elective for any diploma
- ☐ A Career Academic Sequence or Flex Credit course

## **BIOLOGY STANDARD LEVEL, INTERNATIONAL BACCALAUREATE**

3034

(BIO S IB)

*Biology Standard Level, International Baccalaureate* focuses on six core topics: cells; the chemistry of life, genetics, ecology, evolution, and human health and physiology. Optional course topics include neurobiology and behavior, applied plant and animal science, ecology and conservation, diet and human nutrition, physiology of exercise, and cell respiration and photosynthesis.

- ☐ Recommended Grade Level: Grades 11 or 12
- ☐ Credits: 2 semester course, 1 credit per semester
- ☐ Fulfills the Biology I requirement for the General, Core 40, Core 40 with Academic Honors, Core 40 with Technical Honors and International Baccalaureate diplomas or counts as an Elective for any diploma
- ☐ A Career Academic Sequence or Flex Credit course

## **CHEMISTRY I (L)**

3064

(CHEM I)

*Chemistry I* is a course based on laboratory investigations of matter, chemical reactions, and the role of energy in those reactions. Students enrolled in Chemistry I compare, contrast, and synthesize useful models of the structure and properties of matter and the mechanisms of its interactions. In addition, students enrolled in this course are expected to: (1) gain an understanding of the history of chemistry, (2) explore the uses of chemistry in various careers, (3) investigate chemical questions and problems related to personal needs and societal issues, and (4) learn and practice laboratory safety.

- ☐ Recommended Grade Level: 10-12
- ☐ Recommended Prerequisite: Algebra II (can be taken concurrently)
- ☐ Credits: A two credit course
- ☐ Fulfills a Chemistry I requirement for the Core 40, Core 40 with Academic Honors, Core 40 with Technical Honors or a Science Course requirement of the General Diploma

- ☐ A Career Academic Sequence or Flex Credit course

3066

**CHEMISTRY II (L)**  
(CHEM II)

*Chemistry II* is an extended laboratory, field, and literature investigations-based course. Students enrolled in Chemistry II examine the chemical reactions of matter in living and nonliving materials. Based on the unifying themes of chemistry and the application of physical and mathematical models of the interactions of matter, students use the methods of scientific inquiry to answer chemical questions and solve problems concerning personal needs and community issues related to chemistry.

- ☐ Recommended Grade Level: 11-12
- ☐ Recommended Prerequisite: Chemistry I, Algebra II
- ☐ Credits: A two credit course
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

3060

**CHEMISTRY, ADVANCED PLACEMENT (L)**  
(CHEM AP)

*Chemistry, Advanced Placement* is a course based on the content established by the College Board. The content includes: (1) structure of matter: atomic theory and structure, chemical bonding, molecular models, nuclear chemistry; (2) states of matter: gases, liquids and solids, solutions; and (3) reactions: reaction types, stoichiometry, equilibrium, kinetics and thermodynamics. A comprehensive description of this course can be found on the College Board AP Central Course Description web page at:

<http://apcentral.collegeboard.com/apc/public/courses/descriptions/index.html>

- ☐ Recommended Grade Level: 12
- ☐ Recommended Prerequisite: Chemistry I, Algebra II, Precalculus/Trigonometry
- ☐ Credits: A two credit course
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

3070

**CHEMISTRY HIGHER LEVEL, INTERNATIONAL BACCALAUREATE**  
(CHEM H IB)

*Chemistry Higher Level, International Baccalaureate* is designed to introduce students to the theories and practical techniques involved in the composition, characterization, and transformation of substances. As the central science, the chemical principles investigated underpin both the physical world in which we live and all biological systems. Students study eleven core topics: stoichiometry, atomic theory, periodicity, bonding, states of matter, energetics, kinetics, equilibrium, acids and bases, oxidation and reduction, and organic chemistry. Students must complete additional study in nine topics: atomic theory, periodicity, bonding, energetics, kinetics, equilibrium, acids and bases, oxidation and reduction, and organic chemistry. Optional course topics include medicines and drugs, human biochemistry,

environmental chemistry, chemical industries, and fuels and energy. Additional options are modern analytical chemistry and further organic chemistry.

- ☐ Recommended Grade Level: Grades 11 and 12
- ☐ Credits: 4 semester course, 1 credit per semester
- ☐ Fulfills a Chemistry I requirement for the Core 40, Core 40 with Academic Honors, Core 40 with Technical Honors and a Science Course requirement of the General and International Baccalaureate diplomas or counts as an Elective for any diploma
- ☐ A Career Academic Sequence or Flex Credit course

**CHEMISTRY STANDARD LEVEL, INTERNATIONAL BACCALAUREATE**  
3072 (CHEM S IB)

Chemistry Standard Level, International Baccalaureate is designed to introduce students to the theories and practical techniques involved in the composition, characterization, and transformation of substances. As the central science, the chemical principles investigated underpin both the physical world in which we live and all biological systems. Students study eleven core topics: stoichiometry, atomic theory, periodicity, bonding, states of matter, energetics, kinetics, equilibrium, acids and bases, oxidation and reduction, and organic chemistry. Optional course topics include medicines and drugs, human biochemistry, environmental chemistry, chemical industries, and fuels and energy. Higher physical organic chemistry is a further option.

- ☐ Recommended Grade Level: Grades 11 or 12
- ☐ Credits: 2 semester course, 1 credit per semester
- ☐ Fulfills a Chemistry I requirement for the Core 40, Core 40 with Academic Honors, Core 40 with Technical Honors and a Science Course requirement of the General and International Baccalaureate diplomas or counts as an Elective for any diploma
- ☐ A Career Academic Sequence or Flex Credit course

**EARTH AND SPACE SCIENCE I (L)**  
3044 (EAS SCI I)

*Earth and Space Science I* is a course focusing on the study of the earth's layers, atmosphere, hydrosphere, and the structure and scale of the Universe. Students analyze and describe Earth's interconnected systems and examine how Earth's materials, landforms, and continents are modified across geological time. Through laboratory and field investigations, students understand the history and development of the Earth and space sciences, explore the uses of Earth and space science in various careers, and investigate Earth and space science problems concerning personal needs and community issues related to science.

- ☐ Recommended Grade Level: 9-10
- ☐ Credits: A two credit course
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

**EARTH AND SPACE SCIENCE II (L)**  
3046 (EAS SCI II)



*Earth and Space Science II* is an extended laboratory, field, and literature investigations-based course whereby students apply concepts from other scientific disciplines in synthesizing theoretical models of Earth and its interactions with the macrocosm. Students enrolled in this course examine various Earth and space science phenomena, such as the structure, composition, and interconnected systems of Earth and the various processes that shape it, as well as Earth's lithosphere, atmosphere, hydrosphere, and celestial environment. Students analyze and apply the unifying themes of Earth and space science as part of scientific inquiry aimed at investigating Earth and space science problems related to personal needs and community issues.

- ☐ Recommended Grade Level: 10
- ☐ Recommended Prerequisite: Earth and Space Science I
- ☐ Credits: A two credit course
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

### **ENVIRONMENTAL SCIENCE, ADVANCED (L)** **(ENVSCI ADV)**

3010

*Environmental Science, Advanced*, is an interdisciplinary course that integrates biology, Earth science, chemistry, and other disciplines. Students enrolled in this course conduct in-depth scientific studies of ecosystems, population dynamics, resource management, and environmental consequences of natural and anthropogenic processes. Students formulate, design, and carry out laboratory and field investigations as an essential course component. Students completing Environmental Science, Advanced acquire the essential tools for understanding the complexities of national and global environmental systems.

- ☐ Recommended Grade Level: 11-12
- ☐ Recommended Prerequisite: Two credits in Core 40 and AHD science coursework
- ☐ Credits: A two credit course
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

### **ENVIRONMENTAL SCIENCE, ADVANCED PLACEMENT (L)** **(ENVSCI AP)**

3012

*Environmental Science, Advanced Placement* is a course based on content established by the College Board. Students enrolled in AP Environmental Science investigate the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, to identify and analyze environmental problems both natural and human-made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving and/or preventing them. A comprehensive description of this course can be found on the College Board AP Central Course Description web page at:

<http://apcentral.collegeboard.com/apc/public/courses/descriptions/index.html>

- ☐ Recommended Grade Level: 12
- ☐ Recommended Prerequisite: Environmental Science, Advanced
- ☐ Credits: A two credit course

- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

**ENVIRONMENTAL SYSTEMS STANDARD LEVEL, INTERNATIONAL BACCALAUREATE**  
**3014** (ENVS S IB)

*Environmental Systems Standard Level, International Baccalaureate* provides students with a coherent perspective on the environment that is essentially scientific and enables them to adopt an informed and responsible stance on the wide range of environmental issues they will inevitably come to face. The core of Environmental Systems is five broad topics: systems and models, the ecosystem, global cycles and physical systems, human population and carrying capacity, and analyzing ecosystems. Students are required to complete one of the following options: analyzing ecosystems, impacts of resource exploitation, conservation and biodiversity, and pollution management.

- ☐ Recommended Grade Level: Grades 11 or 12
- ☐ Credits: 2 semester course, 1 credit per semester
- ☐ Counts as a Life Science Course for the General diploma or as an Elective for any diploma
- ☐ A Career Academic Sequence or Flex Credit course

**INTEGRATED CHEMISTRY-PHYSICS (L)**  
**3108** (ICP)

*Integrated Chemistry-Physics* is a laboratory-based course in which students explore fundamental chemistry and physics principles. Students enrolled in this course examine, through the process of scientific inquiry, the structure and properties of matter, chemical reactions, forces, motion, and the interactions between energy and matter. Working in a laboratory environment, students investigate the basics of chemistry and physics in solving real-world problems that may have personal or social consequences beyond the classroom.

- ☐ Recommended Grade Level: 9
- ☐ Recommended Prerequisite: Algebra I (may be taken concurrently with this course)
- ☐ Credits: A two credit course
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

**LIFE SCIENCE (L)**  
**3030** (LIFE SCI)

*Life Science* is an introduction to biology course. Students develop problem-solving skills and strategies while performing laboratory and field investigations of fundamental biological concepts and principles. Students explore the functions and processes of cells within all living organisms, the sources and patterns of genetic inheritance and variation leading to biodiversity, and the relationships of living organisms to each other and to the environment as a whole.

- ☐ Recommended Grade Level: 10

- ☐ Credits: A one credit course
- ☐ Fulfills a Science requirement for the General Diploma only or counts as an Elective for the Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

**PHYSICAL SCIENCE (L)**  
(PHY SCI)

3102

*Physical Science* is a course in which students develop problem solving skills and strategies while performing laboratory and field investigations of fundamental chemical, physical, and related Earth and space science concepts and principles that are related to students' interests and that address everyday problems. Students enrolled in Physical Science will explore the structure and properties of matter, the nature of energy and its role in chemical reactions and the physical and chemical laws that govern Earth's interconnected systems and forces of nature.

- ☐ Recommended Grade Level: 9-10
- ☐ Credits: A one credit course
- ☐ Fulfills a Science requirement for the General Diploma only or counts as an Elective for the Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

**PHYSICS I (L)**  
(PHYS I)

3084

*Physics I* is a laboratory-based course in which students synthesize the fundamental concepts and principles related to matter and energy, including mechanics, wave motion, heat, light, electricity, magnetism, atomic and subatomic physics. Through regular laboratory study using such quantities as velocity, acceleration, force, energy, momentum, and charge, students (1) examine the nature and scope of physics, including its relationship to other sciences and its ability to describe phenomena using physical laws, (2) describe the history of physics and its role in the birth of technology, (3) explore the uses of its models, theories, and laws in various careers, and (4) investigate physics questions and problems related to personal needs and societal issues.

- ☐ Recommended Grade Level: 11-12
- ☐ Recommended Prerequisite: Algebra II
- ☐ Credits: A two credit course
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

**PHYSICS II (L)**  
(PHYS II)

3086

*Physics II* is an extended laboratory, field, and literature investigations-based course. Students enrolled in Physics II investigate physical phenomena and the theoretical models that are useful

in understanding the interacting systems of the macro- and microcosms. Students extensively explore the unifying themes of physics, including such topics and applications of physics as mechanics, wave motion, electricity, magnetism, electromagnetism, atomic and nuclear physics, and thermodynamics, etc., in laboratory activities aimed at investigating physics questions and problems concerning personal needs and community issues related to physics.

- ☐ Recommended Grade Level: 11-12
- ☐ Recommended Prerequisite: Physics I, Precalculus/Trigonometry (can be taken concurrently)
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

### **PHYSICS B, ADVANCED PLACEMENT (L)**

3080

(PHYS B AP)

*Physics B, Advanced Placement* is a course based on content established by the College Board that is the equivalent of a terminal, one year college physics course. AP Physics B should provide instruction in each of the content areas (1) Newtonian Mechanics (35%); (2) Fluid Mechanics and Thermal Physics (15%); (3) Electricity and Magnetism (25%); (4) Waves and Optics (15%); and (5) Atomic and Nuclear Physics (10%). A comprehensive description of this course can be found on the College Board AP Central Course Description web page at:

<http://apcentral.collegeboard.com/apc/public/courses/descriptions/index.html>

- ☐ Recommended Grade Level: 12
- ☐ Recommended Prerequisite: Physics I, Pre-Calculus/Trigonometry
- ☐ Credits: A two credit course
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

### **PHYSICS C, ADVANCED PLACEMENT (L)**

3088

(PHYS C AP)

*Physics C, Advanced Placement* is a course based on the content established by the College Board. There are two AP Physics C courses, Physics C: Mechanics, and Physics C: Electricity and Magnetism. AP Physics C: Mechanics provides instruction in each of the following six content areas: kinematics; Newton's laws of motion; work, energy, and power; systems of particles and linear momentum; circular motion and rotation; and oscillations and gravitation. AP Physics C: Electricity and Magnetism provides instruction in each of the following five content areas: electrostatics; conductors, capacitors, and dielectrics; electric circuits; magnetic fields; and electromagnetism. A comprehensive description of this course can be found on the College Board AP Central Course Description web page at:

<http://apcentral.collegeboard.com/apc/public/courses/descriptions/index.html>

- ☐ Recommended Grade Level: 12
- ☐ Recommended Prerequisite: Physics I, Calculus (can be taken concurrently)
- ☐ Credits: A two credit course
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas

- ☐ A Career Academic Sequence or Flex Credit course

**PHYSICS HIGHER LEVEL, INTERNATIONAL BACCALAUREATE**  
**3096** (PHYS H IB)

*Physics Higher Level, International Baccalaureate* is designed to introduce students to the laws of physics, the experimental skills required in physics, and the social and historical aspects of physics as an evolving body of human knowledge about nature. Students study six topics: physics and physical measurement, mechanics, thermal physics, waves, electricity and magnetism, and atomic and nuclear physics. Students must complete additional study in six topics: measurement and uncertainties, mechanics, thermal physics, wave phenomena, electromagnetism, and quantum physics and nuclear physics. Optional course topics from which the student may only choose two include biomedical physics, the history and development of physics, astrophysics, relativity, and optics.

- ☐ Recommended Grade Level: Grades 11 and 12
- ☐ Credits: 4 semester course, 1 credit per semester
- ☐ Fulfills a Physics I requirement for the Core 40, Core 40 with Academic Honors, Core 40 with Technical Honors and a Science Course requirement of the General and International Baccalaureate diplomas or counts as an Elective for any diploma
- ☐ A Career Academic Sequence or Flex Credit course

**PHYSICS STANDARD LEVEL, INTERNATIONAL BACCALAUREATE**  
**3098** (PHYS S IB)

*Physics Standard Level, International Baccalaureate* is designed to introduce students to the laws of physics, the experimental skills required in physics, and the social and historical aspects of physics as an evolving body of human knowledge about nature. Students study six topics: physics and physical measurement, mechanics, thermal physics, waves, electricity and magnetism, and atomic and nuclear physics. Students must complete additional study in six topics: measurement and uncertainties, mechanics, thermal physics, wave phenomena, electromagnetism, and quantum physics and nuclear physics. Optional course topics from which the student may choose two include biomedical physics, the history and development of physics, astrophysics, relativity, and optics. Further options would be mechanics extension, quantum physics, nuclear physics, and further energy.

- ☐ Recommended Grade Level: Grades 11 or 12
- ☐ Credits: 2 semester course, 1 credit per semester
- ☐ Fulfills a Physics I requirement for the Core 40, Core 40 with Academic Honors, Core 40 with Technical Honors and a Science Course requirement of the General and International Baccalaureate diplomas or counts as an Elective for any diploma
- ☐ A Career Academic Sequence or Flex Credit course

**SCIENCE RESEARCH, INDEPENDENT STUDY (L)**  
**3008** (SCI RSRCH IS)

*Science Research, Independent Study* is a course that provides students with unique opportunities for independent, in-depth study of one or more specific scientific problems. Students develop a familiarity with the laboratory procedures used in a given educational,

research, or industrial setting or a variety of such settings. Students enrolled in this course will complete a science fair project to be exhibited at a regional science fair and/or state science symposium, an end-of-course project, such as a scientific research paper, or some other suitable presentation of their findings.

- ☐ Recommended Grade Level: 11-12
- ☐ Recommended Prerequisite: Two credits in Core 40 and AHD science coursework (this course may be taken concurrently with a Core 40 and AHD science course)
- ☐ Credits: A two credit, two semester course that can be taken for a maximum of four semesters and four credits.
- ☐ Counts as a Science Course for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course

### **SCIENCE TUTORIAL**

**3094** *(SCI TUTOR)*

*Science Tutorial* provides students with individualized instruction designed to support success in completing Core 40 science coursework for each year that they are enrolled in Core 40 science courses.

- ☐ Recommended Grade Level: 9-12
- ☐ Recommended Prerequisite: This course must be taken concurrently with a Core 40 science course
- ☐ Credits: A one to eight credit elective course
- ☐ Counts as a Science Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- ☐ A Career Academic Sequence or Flex Credit course